# EUROPEAN PATENT APPLICATION

(12)

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(54) Electronic voting system and relative method.

(57) A system comprising a personal computer (4) for overall vote control and processing; a vote collecting module (master 5) with its own antenna (19); and a number of terminals (6), each having an antenna (22) and a vote selecting keyboard (20), and each identified by a respective code. Following display of a question by the computer (4), the master (5) successively polls the terminals (6) by transmitting one identification code at a time and waiting for an answer from the polled terminal. On recognizing its own identification code, the polled terminal sends back the code together with the vote selected beforehand by the user and stored temporarily in the terminal (6) itself.
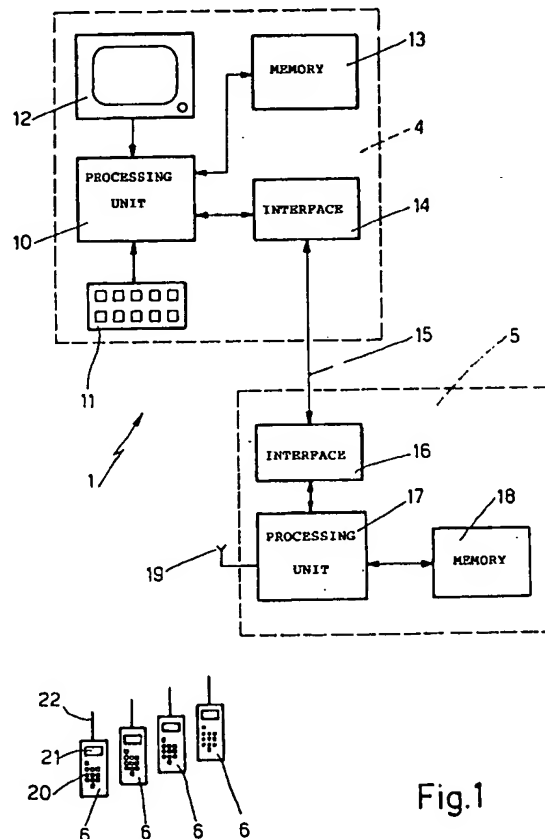
Fig.1

EP 0 556 853 A2

The present invention relates to an electronic voting system and relative method, for selecting and collecting one or more of a number of predetermined answers.

Systems of the aforementioned type are employed whenever a number of people (the "public") are called upon to vote or answer specific questions, e.g. at conventions, for determining assimilation of the topics under discussion; at business or school courses, for assessing comprehension by the participants or students; or at assemblies or congresses, for decision-making purposes.

In general, electronic voting or test systems comprise a number of user terminals for entering votes or answers to specific questions; and a central unit by which the votes or answers are collected and accordingly processed.

For this purpose, the central unit of some known systems is connected physically to the terminals over cables by which the votes or selected answers are transmitted to the central unit. When a large number of terminals are involved, however, such systems present major drawbacks in terms of complexity, flexibility, and initial installation time and cost, which make them unsuitable for other than permanent installation.

In other known systems, the terminals (with a transmission-only function) telecommunicate the votes or answers, together with recognition codes, to the central unit by which they are received and processed accordingly. In this case also, however, when a large number of terminals are involved, such systems present drawbacks due to the difficulty of distinguishing between signals from different terminals.

It is an object of the present invention to provide an electronic voting system of the aforementioned type, designed to overcome the drawbacks typical of known systems, and which, in particular, provides for catering to a large number of terminals, enabling a wide selection of answers, possibly more than one simultaneously, and a high degree of reliability with no particular skill required on the part of the user.

According to the present invention, there is provided an electronic voting system comprising a vote collecting and processing section, and a number of vote selecting terminals; characterized by the fact that said section comprises means for successively polling said terminals by transmitting one identification code at a time, and receiving the vote selected by the polled terminal.

A preferred non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Fig.1 shows a block diagram of the system according to the present invention;

Fig.2 shows a flow chart of the polling method according to the present invention;

Fig.3 shows a detailed flow chart of a block in Fig.2;

Fig.4 shows an indicative structure of a detail in Fig.1.

With reference to Fig.1, the system according to the present invention is indicated as a whole by 1, and is substantially composed of three parts: a general answer control and processing section 4 implementable by means of a personal computer (PC); a terminal polling and answer collecting section 5 hereinafter referred to as the "master"; and a number of terminals 6 (in this case, as many as 4000).

In more detail, computer 4 comprises, in known manner and as regards the present system, a processing unit 10 connected to a data input unit, in this case, a keyboard 11; a display unit (monitor) 12; a program and data memory 13; and an interface 14. Interface 14 is connected over a two-way cable 15 to interface 16 of master 5, for enabling command and information exchange between computer 4 and master 5. Computer 4 may also be connected to other display units, such as projectors or other audiovisual means (not shown) typical of teaching courses or conventions.

In addition to interface 16, master 5 also comprises a processing unit 17 two-way-connected to interface 16, to a memory 18, and to a two-way, e.g. infrared or radio band, antenna 19.

Terminals 6 present an external numeric keyboard 20 for entering the selected answer and possibly confirming termination of a specific voting phase (particularly when more than one answer is selectable); a display window 21 showing the selected answer; a microphone (not shown); a two-way antenna 22 for dialoging with master 5; and appropriate internal units (not shown in detail) for temporarily storing the selected answer, identifying the polling code, and transmitting the answer, as described in more detail with reference to Fig.s 2 to 4.

The voting method implemented by the present system will be described with reference to Fig.2.

To begin with, computer 4 supplies master 5 with a list of the terminals present, loaded or confirmed previously (block 30). From the questions stored beforehand in memory 13, the operator then selects the one for public viewing (block 31), and computer 4 supplies master 5 with a voting start signal (block 32).

On receiving the start signal, master 5 resets the terminals (block 33), and enables computer 4 to display the question for viewing (block 34).

Computer 4 then displays the selected question (block 35), and the public, by means of termi-

nals 6 and from a number of predetermined an-
swers or votes, selects the most appropriate one/s
in response to the question being displayed, and
confirms the entered votes or termination of the
vote selection phase (block 36). Depending on the
situation and the purpose of the vote, the system
conveniently provides for simultaneously selecting,
from 1000 predetermined answers, as many as
three answers to each question.

Terminals 6 are then polled by master 5 and
the votes received from the terminals are transmit-
ted, as shown by block 37 in Fig.2 and as de-
scribed in more detail later on with reference to
Fig.3. The system continues polling the terminals
until the polling phase is terminated by the com-
puter operator, as shown indicatively by inquiry
block 38 in Fig.2. At the end of the terminal polling
phase (YES output of block 38), computer 4 pro-
cesses the answers (block 40) according to a spe-
cific program, by counting, with or without personal
identification, the number of entries relative to dif-
ferent answers (as, for example, when voting at
congresses or similar), or by statistically determin-
ing the percentage of entries relative to a specific
answer, for determining comprehension and as-
similation of the information given.

The terminal polling and answer/vote collecting
procedure performed by master 5 of the present
system will be described with reference to Fig.3.

To begin with (block 45), master 5 sets a
counter n to 1 and enters a variable m equal to the
number of terminals present (MAX) and as sup-
plied by computer 4 in the block 30 phase in Fig.2.
In block 46, master 5 then determines whether the
n-th terminal exists in a table 24 structured as
shown in Fig.4, supplied to master 5 by computer
4, and which, for each terminal identified by a
consecutive number from 1 to MAX (corresponding
to counter n), specifies a unique identification code
stored in the terminal itself. For this purpose, table
24 is divided into two columns, the first, 25, speci-
fying the consecutive number of the terminal, and
the second, 26, specifying the respective identifica-
·tion code (CODE).

In the event the n-th terminal is not in the table
(NO output of block 46), counter n is incremented
one unit (block 47), and master 5 goes back to
block 46 until the n-th terminal is found in table 24,
in which case (YES output of block 46), master 5
transmits the identification code of the n-th terminal
via antenna 19 (block 48). On receiving the iden-
tification code, terminals 6, which switch to hold
after the vote is entered, compare the incoming
code with their own stored in a memory not shown
(block 49), and, in the event the two codes match
(YES output of block 49), transmit the vote or
answers entered previously via keyboard 20 (block
50) together with their own identification code. Con-

versely (NO output of block 49), or in the event the
vote has not been entered or completed, the termi-
nal transmits nothing.

At the end of a given wait time Dt following
transmission of the identification code of the n-th
terminal, master 5 determines whether a valid vote
has been received (block 51), for which purpose, it
determines whether the identification code trans-
mitted by the answering terminal matches the last
one sent, and also performs a congruence check of
the data received. In the event the vote is valid
(YES output of block 51) - the term "vote" also
being intended to possibly include a set of multiple
answers - master 5 transmits the vote to computer
4 and deletes the n-th terminal from table 24 (block
52), then decreases m by one unit (block 53). At
this point, or in the event a valid vote is not
·received within time Dt (NO output of block 51),
master 5 increments counter n by one unit (block
54) and then checks all the terminals have been
scanned by determining whether counter n is
greater than MAX (block 55). If it is not (NO output
of block 55), master 5 goes back to block 46 to
determine whether the n-th terminal is present in
table 24. Conversely (YES output of block 55),
master 5 determines whether votes have been re-
ceived from all the terminals (i.e. m = 0, block 56).
If they have (YES output of block 56), the polling
procedure by master 5 is terminated. Conversely
(NO output of block 56, indicating no response or
transmission of invalid votes by some of the polled
terminals), master 5 resets counter n to 1 (block
57) and goes back to block 46.

System 1 thus provides for reading the vote of
each terminal, performing appropriate validity
checks, and catering to even large numbers of
terminals compatibly with the storage capacity of
master 5 and the processing times involved. More-
over, the system described provides for reliable
identification of each terminal; multiple answer en-
try by the user; a high degree of overall reliability,
even in the event of a large number of terminals or
predetermined answers; and fast, troublefree initial
installation.

The system according to the present invention
may thus be used to advantage at conventions or
business courses, for enabling real-time assess-
ment by lecturers of assimilation by the audience,
as well as for enhancing the audience's attention
span; or in any situation requiring vote-taking for
majority decision-making purposes, or student as-
sessments.

To those skilled in the art it will be clear that
changes may be made to the system as described
and illustrated herein without, however, departing
from the scope of the present invention. For exam-
ple, transmission between master 5 and terminals 6
may be effected via electromagnetic radiation over

any suitable band; the communication protocols may be more complex or more straightforward than as described, e.g. the terminal identification code itself may be used as a terminal counter; and the successfully polled terminal storage procedure may also differ from that described. In particular, valid votes may be transmitted by master 5 to computer 4 during polling of the terminals, immediately following acquisition of the valid vote, as described with reference to Fig.3, or at the end of the polling phase, by transmitting all the polled terminal votes together with the respective identification codes. In this case, table 24 may also be used for storing the incoming votes, and deletion of the terminal may consist solely in deleting the consecutive number n in column 25.

## Claims

1. An electronic voting system comprising a vote collecting and processing section (4, 5), and a number of vote selecting terminals (6); characterized by the fact that said section (4, 5) comprises means (37) for successively polling said terminals (6) by transmitting (48) one identification code at a time, and receiving (51) the vote selected by the polled terminal.

2. A system as claimed in Claim 1, characterized by the fact that each said terminal (6) comprises means (20) for selecting a vote; and means (36) for storing the selected vote.

3. A system as claimed in Claim 2, characterized by the fact that each said terminal (6) comprises means (22) for receiving said identification code; means (49) for comparing said received identification code with a stored code; and means (22, 50) for transmitting said selected vote in the event said received identification code and said stored code match.

4. A system as claimed in any one of the foregoing Claims from 1 to 3, characterized by the fact that said section (4, 5) comprises means (18, 24) for storing a number of codes, each assigned to a respective terminal (6); and means (52) for deleting said assigned code from said storage means upon the vote from the respective terminal (6) being received.

5. A system as claimed in Claim 4, characterized by the fact that said section (4, 5) comprises means (37, 38) for cyclically polling said terminals (6) relative to said codes stored in said storage means (18, 24).

6. A system as claimed in any one of the foregoing Claims from 1 to 5, characterized by the fact that said section comprises a processing and control unit (4) and a vote collecting unit (5).

7. A system as claimed in Claim 6, characterized by the fact that said processing and control unit comprises a personal computer (4), and said vote collecting unit (5) comprises an antenna (19) for wireless connection to said terminals (6).

8. An electronic voting method comprising steps wherein votes selected by means of a number of terminals (6) are collected and processed; characterized by the fact that it comprises a step wherein said terminals (6) are successively polled via transmission of an identification code, and one vote at a time is transmitted by the polled terminal.

9. A method as claimed in Claim 8, characterized by the fact that it comprises a step wherein a vote is selected, and the selected vote is memorized.

10. A method as claimed in Claim 9, characterized by the fact that it also comprises steps wherein: said identification code is received; said received identification code is compared with a stored code; and said selected vote is transmitted in the event said received identification code and said stored code match.

11. A method as claimed in any one of the foregoing Claims from 8 to 10, characterized by the fact that it comprises steps wherein a number of codes are stored, each assigned to a respective terminal; and said assigned code is deleted upon the vote from the respective terminal (6) being received.

12. A method as claimed in Claim 11, characterized by the fact that it comprises a step wherein the terminals (6) relative to the stored codes are polled cyclically.

13. A method as claimed in any one of the foregoing Claims from 8 to 12, characterized by the fact that said steps for polling the terminals via transmission of said identification code and for transmitting the vote are performed via radiated wave transmission.
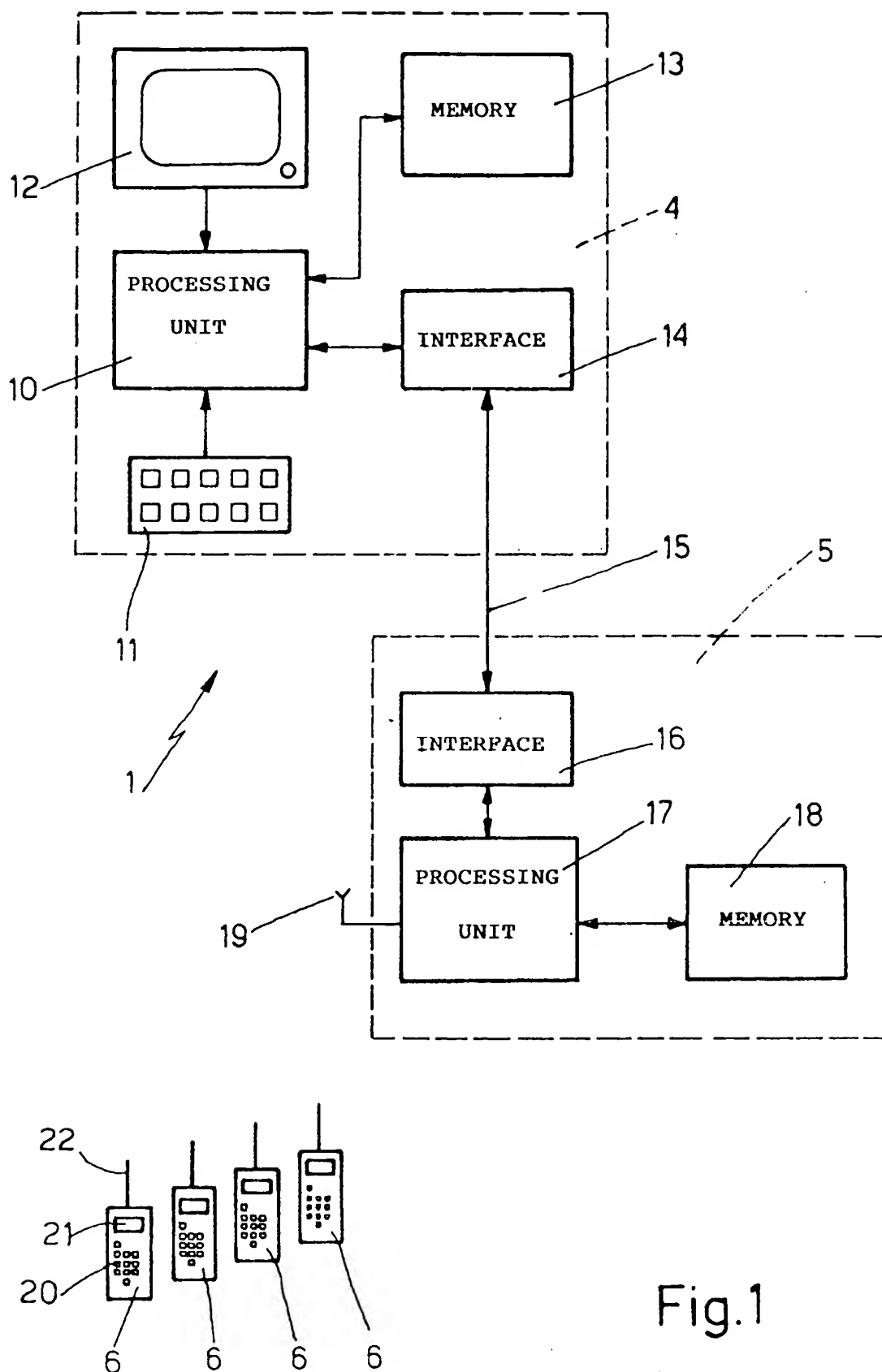
Fig.1

START

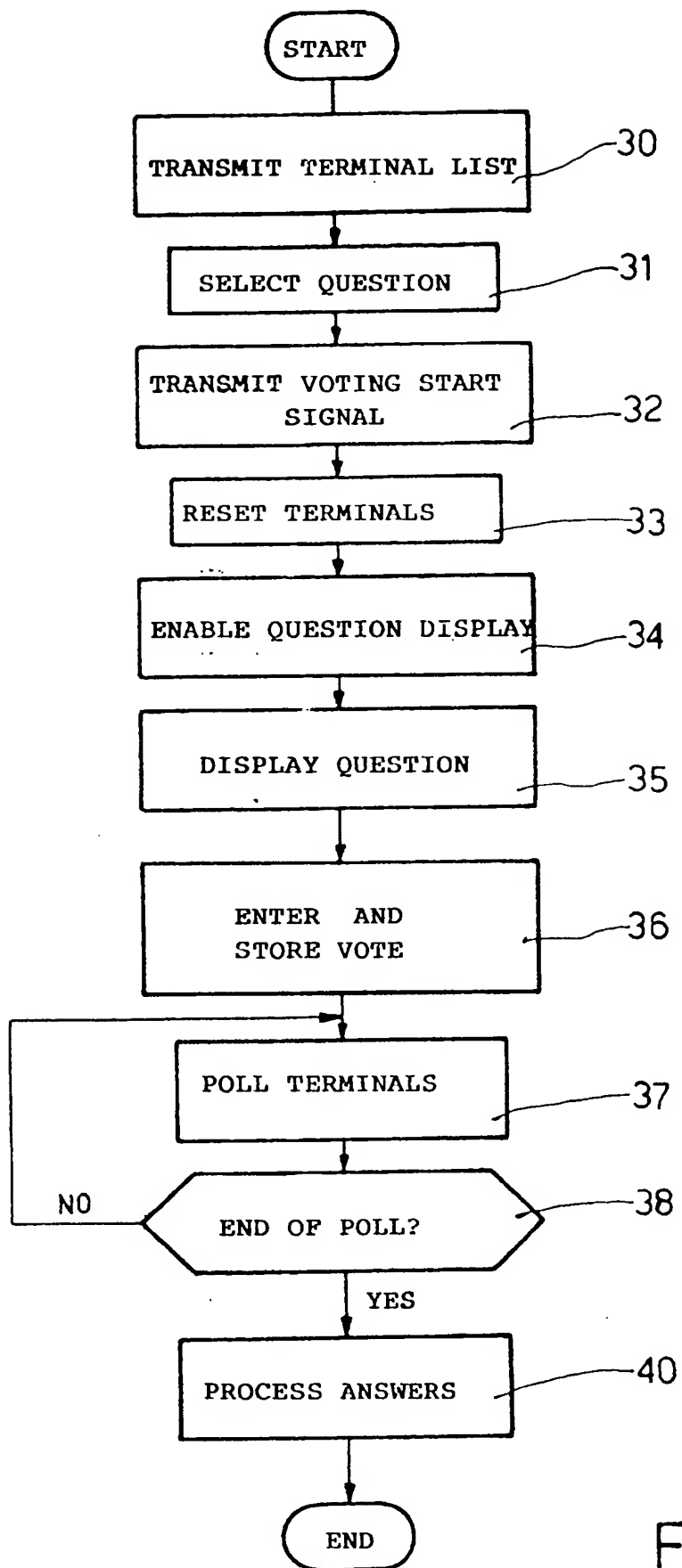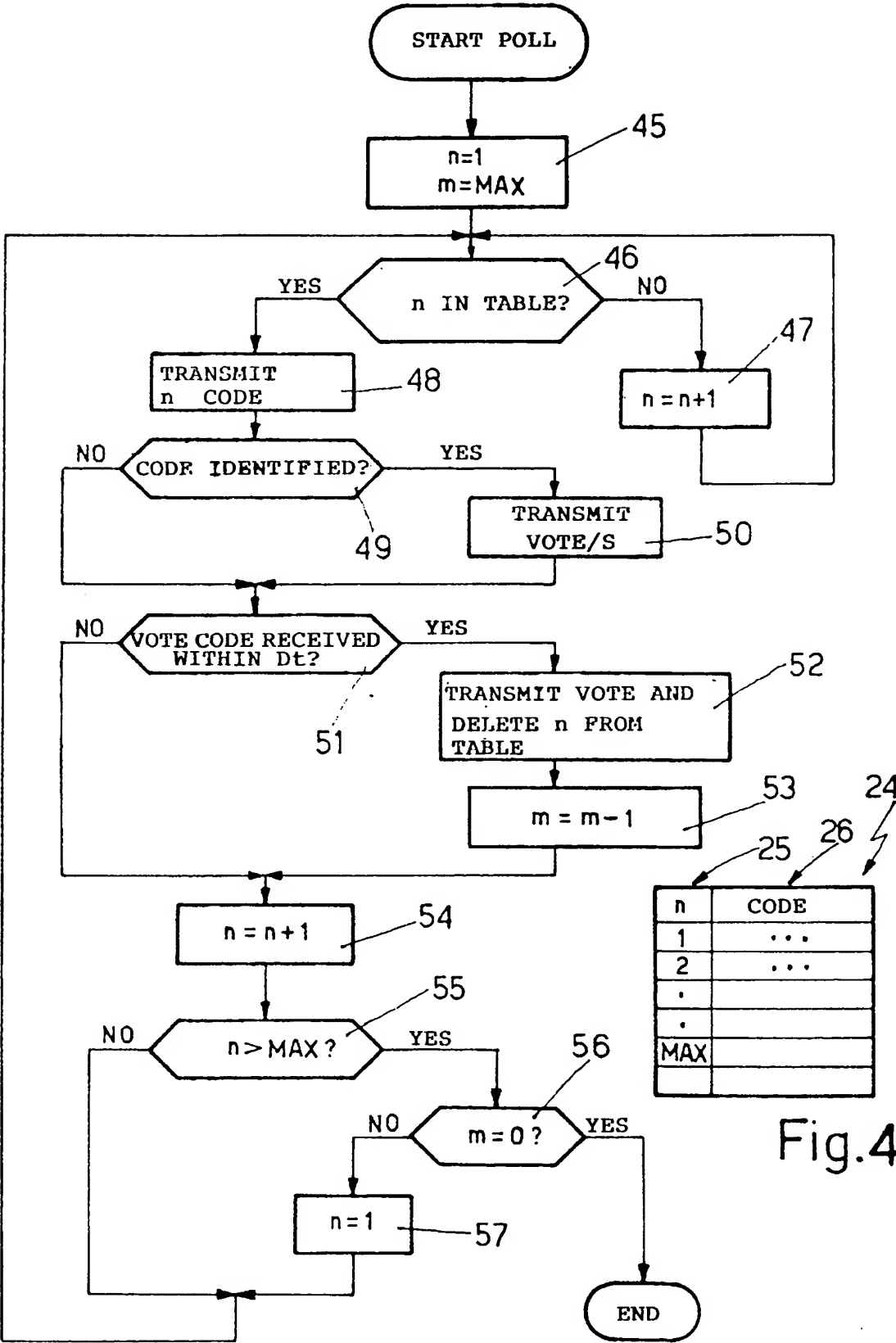TRANSMIT TERMINAL LIST —30

SELECT QUESTION —31

TRANSMIT VOTING START SIGNAL —32

RESET TERMINALS —33

ENABLE QUESTION DISPLAY —34

DISPLAY QUESTION —35

ENTER AND STORE VOTE —36

POLL TERMINALS —37

END OF POLL? —38

NO

YES

PROCESS ANSWERS —40

END

Fig.2

START POLL

n=1
m=MAX
— 45

n IN TABLE? — 46

YES → TRANSMIT n CODE — 48

NO → n = n+1 — 47

CODE IDENTIFIED? — 49

NO

YES → TRANSMIT VOTE/S — 50

VOTE CODE RECEIVED WITHIN Dt? — 51

NO

YES → TRANSMIT VOTE AND DELETE n FROM TABLE — 52

m = m−1 — 53

n = n+1 — 54

n > MAX? — 55

NO

YES → m = 0 ? — 56

NO → n = 1 — 57

YES → END

Fig.3

| n | CODE |
|-----|------|
| 1 | . . . |
| 2 | . . . |
| . | |
| . | |
| MAX | |

— 25  — 26  — 24

Fig.4